Marne and Associates, Inc.
Experts in Electrical Code

February 11, 2008

REPLY DECLARATION OF DAVID J. MARNE, P.E.

Comments on "Affidavit of Anthony Ramirez in Support of Response" (Exhibit AR-1 and Exhibit AR-2)

Introduction

The intent of this document is to address statements in the, "Affidavit of Anthony Ramirez in Support of Response" (Exhibit AR-1 and Exhibit AR-2)." PSE&G appears to be citing National Electrical Safety Code® (NESC®) rules to prohibit the attachment of NextG's communication antenna while in fact the NESC contains several rules recognizing and providing methods for the safe installation of a communications antenna in the supply space on a pole top. More specifically, the following NESC rules address the installation of a communication antenna in the supply space.

NESC Rule 235I titled, Clearances in any direction from supply line conductors to communication antennas in the supply space attached to the same supporting structure

NESC Rule 239H titled, Requirements for vertical communication conductors passing through supply space on jointly used structures

NESC Rule 420Q titled, Communication antennas

Installation of a communications antenna on a power pole does take cooperation between the parties involved but the basic provisions for safety are addressed in the NESC.

Comments on "Safety Issues Relating to Pole Top Antennas"

1st Bullet:
Grounded equipment in proximity to energized power facilities is commonplace in the electric utility industry. A grounded transformer case, a grounded lightning arrestor, a grounded static wire, and even a grounded steel pole are common examples of grounded equipment in close proximity to energized power facilities. The same skill and care used around this equipment would be used by PSE&G crews around NextG's antenna and associated equipment. The statement that PSE&G is "one of few" utilities

in the country that performs maintenance and repairs on live (electrically energized) conductors and facilities by "gloving" is an exaggeration. Rubber gloving is used by electric utilities around the country. Power linemen are trained in rubber glove work and rubber glove techniques are covered in OSHA Standard 1910.269 and Part 4 of the National Electrical Safety Code.

2nd Bullet:
The NESC rule cited by PSE&G (NESC Rule 446) appears to apply to live-line bare-hand work and does not contain cover-up wording that the applicable OSHA standard (OSHA 1910.269) contains. The OSHA standard applicable to this work is shown below:

> **1910.269(q)(3)(xiii)**
>
> The minimum approach distances specified in Table R-6 through Table R-10 shall be maintained from all grounded objects and from lines and equipment at a potential different from that to which the live-line bare-hand equipment is bonded, unless such grounded objects and other lines and equipment are covered by insulating guards.

Independent of the application of the rule, NextG's antenna will be located a minimum of 40 inches away for the energized line and NextG's communication riser feeding the antenna will be covered with suitable nonmetallic material. The 40 inch requirement and the nonmetallic covering requirement are specified in NESC Rule 239H.

3rd Bullet:
NextG's antenna will be grounded bonded to PSE&G's ground (not separately grounded). The safe installation practice for the connection between the pole top antenna and the communications equipment near the base of the pole is covered in NESC Rule 239H.

4th Bullet:
The safe installation practices related to wind forces on equipment and weights of equipment are covered in NESC Sections 24, 25, and 26. The NESC rules in these sections are applicable to electric power lines and equipment as well as communications lines and equipment. It is possible for the pole top conductor on a power pole (energized phase or grounded static) to have more weight and a larger wind surface area (when considering the wind span length and weight span length) than a pole top antenna.

5th Bullet:
The safe installation practices related to wind forces on equipment and weights of equipment are covered in NESC Sections 24, 25, and 26. The NESC rules in these sections protect the general public from falling energized lines and equipment and from

falling communication lines and equipment. The grade of construction in the NESC is higher for energized lines and equipment (typically Grade C) compared to communication lines and equipment (typically Grade N) due to the higher danger that energized lines impose. However, when communications lines are attached to power poles the NESC requires that the communication lines be attached using the same grade of construction as the energized lines.

6th Bullet:
NESC Rule 420Q addresses worker exposure to radio frequencies. It is my understanding that NextG has hired a radio frequency (RF) expert to determine exposure levels and compare the levels to applicable regulatory standards.

Comments on "Reliability Issues With Pole Top Antennas"

1st Bullet:
No comment.

2nd Bullet:
As discussed above, the installation of a pole top antenna can be accomplished with the continued use of rubber gloving techniques.

3rd Bullet:
I do not have any comments on lightning strike data (number of times per year or percentages). Some electric utilities mount a static or neutral at the top position on their poles. This is very common with transmission lines but only common on distribution lines in very high lightning areas. Assuming PSE&G mounts a static or neutral at the top position of their distribution poles, it would be possible, but difficult, to mount the NextG antenna on the pole top. It is my understanding that in areas with distribution poles having a static or neutral at the top position of the pole, Next G agreed to find secondary and guy poles for mounting the antennas. From a reliability standpoint, a lightning strike to a transmission line could take out power to an entire city. A lightning strike to a distribution line could take out power to an entire neighborhood. A lightning strike to a secondary only pole could take out power to one or two houses. Since it is not common for electric utilities to do any special lightning protection or shielding on secondary only poles or guy poles, it seems reasonable to assume that mounting a NextG antenna on a secondary or guy pole will not have much of an impact on reliability.

4th Bullet:
It is my understanding that NextG recognizes that the NextG communication antenna installed in the supply space must be installed and maintained by supply workers (power lineman). This installation is being addressed by utilities around the country by the communication utility paying a fee to the electric utility for the time to install and maintain the antenna or by the electric utility supplying the communications utility a list of power line contractors that the electric utility uses or qualifies to work on their system. The

communication utility then contracts with the power line contractor to meets the qualified worker provision.

Comments on "Other Issue"

1st Bullet:
I am assuming NextG is willing to pay their fare share of a pole replacement for a pole that has a rotten pole top or NextG would work with PSG&E to select a neighboring pole that does not have a rotten pole top. I would also assume that the poles in question do not have a static or neutral in the top position of the pole or that the pole top rot has not extended down to the crossarm mounting position or else the pole would need to be replaced purely for electrical power use.

Attachments: NESC Rules 235I, 239H, and 420Q.

Attachment B

NESC® Rules 235I, 239H, and 420Q

3. Conductors shall be arranged so that the vertical spacing shall be not less than that specified in Table 235-8 under the conditions specified in Rule 235C2b(1)(c)

4. *A supporting neutral conductor of a supply cable meeting Rule 230C3 or an effectively* grounded messenger of a supply cable meeting Rule 230C1 or 230C2 may attach to the same insulator or bracket as a neutral conductor meeting Rule 230B1, so long as the clearances of Table 235-8 are maintained in mid-span and the insulated energized conductors are positioned away from the open supply neutral at the attachment.

H. Clearance and spacing between communication conductors, cables, and equipment

1. The spacing between messengers supporting communication cables should be not less than 300 mm (12 in) except by agreement between the parties involved.

2. The clearances between the conductors, cables, and equipment of one communication utility to those of another, anywhere in the span, shall be not less than 100 mm (4 in), except by agreement between the parties involved.

I. Clearances in any direction from supply line conductors to communication antennas in the supply space attached to the same supporting structure

1. General

Communication antennas located in the supply space shall be installed and maintained only by personnel authorized and qualified to work in the supply space in accordance with the applicable rules of Sections 42 and 44. See also Rule 224A.

2. Communication antenna

The clearance between a communication antenna operated at a radio frequency of 3 kHz to 300 GHz and a supply line conductor shall be not less than the value given in Table 235-6, row 1b.

NOTE 1: The antenna functions as a rigid, vertical, or lateral open wire communication conductor.

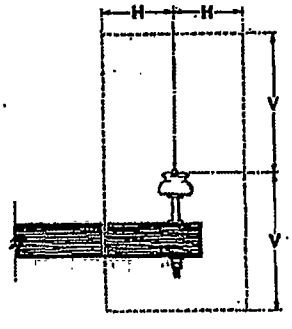
NOTE 2: See Rule 420Q.

3. Equipment case that supports a communication antenna

The clearance between an equipment case that supports a communication antenna and a supply line conductor shall be not less than the value given in Table 235-6, Row 4a.

4. Vertical or lateral communication conductors and cables attached to a communication antenna

The clearance between a supply line conductor and the vertical or lateral communication conductor and cable attached to a communication antenna shall be not less than the value given in Rule 239.



V = Vertical clearance
H = Horizontal clearance

Figure 235-1—Clearance diagram for energized conductor

EXCEPTION: Vertical runs of effectively grounded supply conductors may have a clearance of 25 mm (1 in).

H. Requirements for vertical communication conductors passing through supply space on jointly used *structures*

All vertical runs of communication conductors passing through supply space shall be installed as follows:

1. Metal-sheathed communication cables

   Vertical runs of metal-sheathed communication cables shall be covered with suitable nonmetallic material, where they pass trolley feeders or other supply line conductors. This nonmetallic covering shall extend from a point 1.0 m (40 in) above the highest trolley feeders or other supply conductors, to a point 1.80 m (6 ft) below the lowest trolley feeders or other supply conductors, but need not extend below the top of any mechanical protection that may be provided near the ground.

   EXCEPTION 1: Communication cables may be run vertically on the pole through space occupied by railroad signal supply circuits in the lower position, as permitted in Rule 220B2, without covering within the supply space.

   EXCEPTION 2: Covering is not required in the supply space on metallic or concrete supporting structures.

2. Communication conductors

   Vertical runs of insulated communication conductors shall be covered with suitable nonmetallic material, to the extent required for metal-sheathed communication cables in Rule 239H1, where such conductors pass trolley feeders or supply conductors.

   EXCEPTION 1: Communication conductors may be run vertically on the structure through space occupied by railroad-signal supply circuits in the lower position, as permitted in Rule 220B2, without covering within the supply space.

   EXCEPTION 2: Covering is not required in the supply space on metallic or concrete supporting structures.

3. Communication grounding conductors

   Vertical communication grounding conductors shall be covered with suitable nonmetallic material between points at least 1.80 m (6 ft) below and 1.0 m (40 in) above any trolley feeders or other supply line conductors by which they pass.

   EXCEPTION 1: Communication grounding conductors may be run vertically on the structure though space occupied by railroad-signal supply circuits in the lower position, as permitted in Rule 220B2, without covering within the supply space.

   EXCEPTION 2: Covering is not required in the supply space on metallic or concrete supporting structures.

4. Clearance from through bolts and other metal objects

   Vertical runs of communication conductors or cables shall have a clearance of one-eighth of the pole circumference but not less than 50 mm (2 in) from exposed through bolts and other exposed metal objects attached thereto that are associated with supply line equipment.

   EXCEPTION: Vertical runs of effectively grounded communication cables may have a clearance of 25 mm (1 in).

I. Operating rods

Effectively grounded or insulated operating rods of switches are permitted to pass through the communication space, but shall be located outside of the climbing space.

J. Additional rules for standoff brackets

1. Standoff brackets may be used to support the conduit(s). Cable insulation appropriate for the intended service is required; non-metallic conduit shall not be used to meet basic insulation requirements.

   NOTE: See Rule 217A2.

O. Cable reels

Cable reels shall be securely blocked so they cannot roll or rotate accidentally.

P. Street and area lighting

1. The lowering rope or chain, its supports, and fastenings shall be examined periodically.
2. A suitable device shall be provided by which each lamp on series-lighting circuits of more than 300 V may be safely disconnected from the circuit before the lamp is handled.

   EXCEPTION: This rule does not apply where the lamps are always worked on from suitable insulated platforms or aerial lift devices, or handled with suitable insulated tools, and treated as under full voltage of the circuit concerned.

Q. Communication antennas

When working in the vicinity of communication antennas operating in the range of 3 kHz to 300 GHz, workers shall not be exposed to radiation levels that exceed those set forth by the regulatory authority having jurisdiction.

NOTE: See OSHA 29 CFR 1910.97, Subpart G [B63]; OSHA 29 CFR 1910.268, Subpart R [B64]; FCC Bulletin No. 65 [B30]; IEEE Std C95.1™-2005 [B57].

421. General operating routines

A. Duties of a first-level supervisor or person in charge

This individual shall:

1. Adopt such precautions as are within the individual's authority to prevent accidents.
2. See that the safety rules and operating procedures are observed by the employees under the direction of this individual.
3. Make all the necessary records and reports, as required.
4. Prevent unauthorized persons from approaching places where work is being done, as far as practical.
5. Prohibit the use of tools or devices unsuited to the work at hand or that have not been tested or inspected as required.

B. Area protection

1. Areas accessible to vehicular and pedestrian traffic
   a. Before engaging in work that may endanger the public, safety signs or traffic control devices, or both, shall be placed conspicuously to alert approaching traffic. Where further protection is needed, suitable barrier guards shall be erected. Where the nature of work and traffic requires it, a person shall be stationed to warn traffic while the hazard exists.
   b. When openings or obstructions in the street, sidewalk, walkways, or on private property are being worked on or left unattended during the day, danger signals, such as warning signs and flags, shall be effectively displayed. Under these same conditions at night, warning lights shall be prominently displayed and excavations shall be enclosed with protective barricades.
2. Areas accessible to employees only
   a. If the work exposes energized or moving parts that are normally protected, safety signs shall be displayed. Suitable barricades shall be erected to restrict other personnel from entering the area.
   b. When working in one section where there is a multiplicity of such sections, such as one panel of a switchboard, one compartment of several, or one portion of a substation, employees shall mark the work area conspicuously and place barriers to prevent accidental contact with energized parts in that section or adjacent sections.

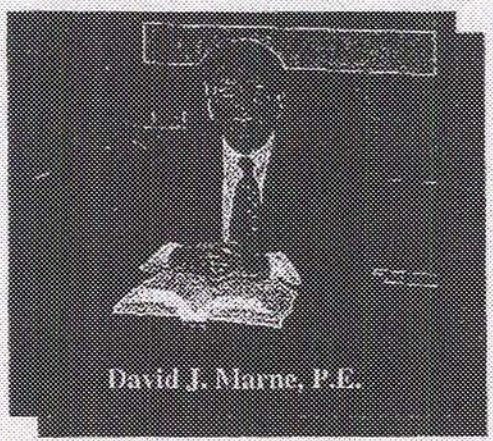
Attachment C

Curriculum Vitae of David J. Marne, P.E.

Curriculum Vitae

David J. Marne, P.E.

Marne and Associates, Inc.
619 S.W. Higgins, Suite C
Missoula, MT 59803
Phone: (406) 544-8997
Fax: (406) 549-8952
Email: davem@marneassociates.com
Web: www.marneassociates.com



David J. Marne, P.E. is a registered professional electrical engineer. Mr. Marne is the author of *McGraw-Hill's National Electrical Safety Code® (NESC®) Handbook* and is a nationally recognized speaker on the NESC®. He serves on NESC® Subcommittee 4, Overhead Lines – Clearances. He is company president and senior electrical engineer for Marne and Associates, Inc. in Missoula, Montana where he specializes in National Electrical Safety Code® (NESC®) training, OSHA training, and engineering design. Mr. Marne has over 24 years experience engineering and managing transmission and distribution line projects, substation projects, electrical system planning studies, and joint use (power and communication) projects.

The 2007 National Electrical Safety Code® (NESC®) (above left) and McGraw-Hill's NESC® Handbook authored by David J. Marne, PE (above right)

Education

Montana State University, Bozeman, Montana
Bachelor of Science in Electrical Engineering (BSEE)
Graduation Date: June 1983

Various Continuing Education Courses, 1983-present
Transmission and Distribution Line Design and Staking, Substation Design, System Protection and Coordination, System Over-voltage Design, Engineering and Operations Conferences, Pole Conferences, Joint Use (Power and Communications) Conferences, Electromagnetic Fields (EMF), Corrosion Control, Project Management, Finance and Accounting, OSHA Compliance and Workplace Safety, OSHA 1910.269 Qualified Worker, National Electrical Safety Code® (NESC®) Sub-Committee Meetings.

Experience

Transmission and Distribution Line Engineering

Responsible for the engineering management and/or engineering design of over 40 transmission line related projects and over 225 distribution line related projects. Projects have involved a variety of voltage levels, conductor sizes, structure types, terrain types, right-of-way constraints, and environmental issues. Designs for transmission and distribution lines include both overhead and underground circuits (including underwater locations) in both urban and rural settings. Engineering services provided for transmission and distribution engineering projects include planning, cost estimating, design, bidding, construction administration, construction observation, right-of-way, and permitting.

Substation Engineering

Responsible for the engineering management and/or engineering design of over 60 substation related projects. Projects have involved a variety of voltage levels, transformer ratings, bus sizes, structure types, site plans, grounding issues, protection schemes, metering types, communication systems, ownership, and environmental issues. Designs for substations include both live front and dead front equipment in both urban and rural settings. Engineering services for substation projects include planning, cost estimating, design, bidding, construction administration, construction observation, site work, and permitting.

Electrical System Planning Studies

Responsible for the engineering management and/or engineering design of over 95 electrical system planning related studies. Projects have involved a variety of studies including long range plans, construction work plans, sectionalizing and coordination studies, voltage drop studies, fault current studies, motor starting studies, power factor analysis, electromagnetic field (EMF) reports, and environmental studies.

Experience (continued)

Joint Use (Power and Communication) Engineering

Responsible for the engineering management and/or engineering design of over 25 joint use (power and communication) related projects. Projects have involved a variety of power line voltage levels and communication line (phone, CATV, fiber) cable types. Engineering services include calculating and reviewing clearance, and strength and loading issues in accordance with the National Electrical Safety Code® (NESC®) and Joint Use Agreements. Services also include field data gathering, determining make-ready requirements, and field construction observation.

National Electrical Safety Code® (NESC®)

Nationally recognized expert on the National Electrical Safety Code® (NESC®). Author of *McGraw-Hill's NESC® Handbook* and presenter of NESC® seminars around the United States. (See Publications and Presentations for additional information.)

Knowledgeable of the National Electrical Code® (NEC®), Occupational Safety and Health (OSHA) Regulation 1910.269, 1910.268, and 1926.950 through 1926.960, California General Order 95 (GO95) and other codes and standards related to the electrical power and communication utility industries.

Electrical Investigations/Expert Witness Opinions

Electrical investigations and expert witness opinions for cases involving power line contacts, electrocution, lightning, power failure, process control systems damage, and electrical service failures resulting in loss of life, injury, and property damage. Electrical investigations related to electromagnetic field (EMF) concerns. Electrical investigations related to power theft and stray voltage complaints.

Management Experience

President and CEO of Marne and Associates, Inc. Responsible for all aspects of corporate management and company direction.

Branch Manager of SSR Engineers, Inc., Missoula, Montana office. Responsibilities included administration, marketing, and engineering. Reported directly to the company president of an 80+ employee firm spread across five offices. Elected to SSR Engineers, Inc. Board of Directors in 1998 and served as a trustee on the Board of Directors until SSR Engineers was purchased by HDR Engineering in 2003.

Department Manager of the Transmission and Distribution (T&D) group of HDR Engineering in Missoula, Montana. Similar management duties as described above in addition to maintaining relationships with other managers and corporate personnel throughout a 3200+ employee firm with over 80 offices.

Work History

Marne and Associates, Inc.

Missoula, Montana 2005-Present
President
President of Marne and Associates, Inc. which provides National Electrical Safety Code® (NESC®) training (public seminars, in-house seminars, and web based training), OSHA training, training aids (software, books, manuals, etc.), accident investigation, expert witness services, and engineering design.

HDR Engineering, Inc.

Missoula, Montana 2003-2005
Transmission and Distribution Department Manager/Senior Electrical Engineer
(HDR Engineering purchased SSR Engineers on 8/1/03)

Department manager and senior electrical engineer in charge of electrical engineering design for electric utility clients and National Electrical Safety Code® (NESC®) presentations.

SSR Engineers, Inc.

Missoula, Montana 1990-2003

Branch Manager/Senior Electrical Engineer

Branch manager and senior electrical engineer in charge of electrical engineering design for electric utility clients and National Electrical Safety Code® (NESC®) presentations.

Project Engineer 1988-1990

(SSR Engineers purchased General Engineers on 3/1/88)

Project electrical engineer involved with electrical power, lighting, and communication projects for utility, industrial, and commercial clients.

General Engineers, Inc.

Missoula, Montana 1985-1988

Design Engineer

Design electrical engineer involved with electrical power, lighting, and communication projects for utility, industrial, and commercial clients.

Mare Island Naval Shipyard

Vallejo, California 1983-1985
Design Engineer
Design electrical engineer involved with electrical power, lighting, and communication projects for the public works department of a naval shipyard.

Publications

Marne, David J., *McGraw-Hill's National Electrical Safety Code® (NESC®) 2007 Handbook*, Conforms to the 2007 NESC®, McGraw-Hill Publishing, New York, NY, 2007

Marne, David J., *McGraw-Hill's National Electrical Safety Code® (NESC®) Handbook*, Conforms to the 2002 NESC®, McGraw-Hill Publishing, New York, NY, 2002

National Electrical Safety Code® and NESC® are registered trademarks of the Institute of Electrical and Electronics Engineers (IEEE).

Presentations

- Applying the National Electrical Safety Code® (NESC®) to Day-to-Day Utility Work
  Presented at various utility associations and utility companies across the United States.
- Applying the National Electrical Safety Code® (NESC®) to Day-to-Day Utility Work – Transmission Voltage Focus
  Presented at various utility companies across the United States.
- National Electrical Safety Code® (NESC®) Rules for Joint Use Construction
  Presented at various utility associations and utility companies across the northwest.
- Major Changes and General Overview of the 2007 National Electrical Safety Code® (NESC®)
  Presented at various utility associations and utility companies across the United States.
- Major Changes and General Overview of the 2002 National Electrical Safety Code® (NESC®)
  Presented at various utility associations and utility companies across the United States.
- Major Changes and General Overview of the 1997 National Electrical Safety Code® (NESC®)
  Presented at various utility associations and utility companies around the northwest.
- OSHA 1919.269: Electric Power Generation, Transmission and Distribution
  Presented web seminars for various utility companies across the United States.
- OSHA 1919.268: Telecommunications
  Presented web seminars for various utility companies across the United States.
- Distribution Line Design
  Presented web seminars for various utility companies across the United States.

Awards

IEEE Senior Engineer Membership Award
SSR Engineers, Inc. 15 year service award
HDR Engineering, Inc. Professional Associates and Pathfinders Award

Professional Affiliations

Institute of Electrical and Electronics Engineers (IEEE), Senior Member Status
IEEE Power Engineering Society (PES)
National Society of Professional Engineers (NSPE)
Montana Society of Professional Engineers (MSPE)

Licensure

Professional Engineer, State of Montana, License Number 9428PE
Professional Engineer, State of Idaho, License Number 6426
Professional Engineer, State of Washington, License Number 39601

Attachment 5
NextG DAS Street Light Installation
In Del Mar, California